**EASTERN SEABOARD FOOD SECURITY: SYSTEMS THAT LINK LOCAL PRODUCTION CAPACITY WITH REGIONAL CONSUMER DEMAND**

**COOPERATING INSTITUTIONS[1]:** USDA-Agricultural Research Service, USDA-Economic Research Service, Massachusetts Institute of Technology, Iowa State University, Tufts University, Pennsylvania State University, USDA-Agricultural Marketing Service.

**RESEARCH PROBLEM:** Food industry observers with diverse perspectives have coalesced around concerns that food-related energy use and average food miles are trending in the wrong direction. Although inflation-adjusted energy prices have more than doubled since 2002, there is little compelling evidence that the food system is becoming more energy or food miles efficient. Even if energy prices are not influencing these outcomes, many are asking why not and how could food-related energy policies be used to reverse such trends. In addition, significant dependence on centralized and distant produced foods is raising concerns that consumers, particularly in urban population centers, are vulnerable to risks of interrupted food supply due to health safety and natural disasters. Questions of this magnitude will be most effectively addressed by undertaking a system-wide assessment to find the most viable ways local-based production could be used to significantly meet urban consumer demand.

Food consumption within the Eastern Seaboard Region from Virginia to Maine is indicative of the concerns many have with food system consolidation and globalization, and their possible impacts on U.S. food security. A substantial percentage of the food supply for the region comes from outside sources, with over 65% of the vegetables and 80% of the fruits consumed are currently produced elsewhere[2]. However, increasingly heavy reliance on outside sources of food – while certainly pushing up average food miles – empirically may or may not be driving up total food-related energy use. With the region's current population of 69-million expected to rise by another 6.6-million by 2030[3], the sustainability of the existing food system will continue to be seriously questioned. Greater reliance on locally grown food such as specialty crops has been widely touted as a logical approach for reducing transportation costs, stimulating local/rural development, diversifying the geography of food production, and possibly helping improve nutrition by providing consumers with greater access to fresh and tasteful fruits and vegetables. We propose to rigorously test these hypotheses using a comprehensive integrated biophysical and economic assessment framework that touches on all aspects important to sustainability using a systems-wide material flow analysis[4] as a theoretical foundation.

**OVERALL GOAL:** To determine the potential seasonal capacity, natural resources impacts, and supply chain requirements for locally produced agricultural products meeting Eastern Seaboard Region urban market demand, now and in the future, and to identify the biophysical, infrastructure, and socioeconomic challenges of realizing that potential.

**OBJECTIVES:**

1. Quantify current local specialty crop production and consumption as spatially and temporally distributed across the Eastern Seaboard Region.

2. Determine the potential production capacity and supply chain requirements for locally grown specialty crops, and compare to primary outside production region sources.

3. Identify the principle system constraints – biophysical resources, supply chain infrastructure, energy, and policies – that could limit present or future expansion of locally produced specialty crops and their market reach.

4. Develop the information technology needed to efficiently link producers to markets so the needs of large urban center consumers can be met by local production.

5. Evaluate long-term sustainability of alternative production scenarios including system dependability in response to potential risks brought on by market fluctuations, disasters, and climate change.

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[2] USDA-Agricultural Research Service, unpublished data, 2008.
[3] US Census Bureau, Interim Projections 2000-2030 based on Census 2000 (released 2005).
[4] United Nations, European Commission, International Monetary Fund, Organization for Economic Cooperation and Development, and World Bank. 2003. Handbook of National Accounting, Integrated Environmental and Economic Accounting, Studies in Methods, Series F, No. 61, Rev. 1 (ST/ESA/STAT/SER.F/61/Rev.1)

**APPROACH:** Our overall approach is to develop, link, and analyze a series of spatially referenced databases describing availably land and soil suitability for agricultural production, temporal climatic variables, crop growth requirements, and transportation-market infrastructure at a maximal county-level scale for the Eastern Seaboard Region. A database will be developed by ARS that includes prime farmland and "additional farmland of importance" (initially excludes urban soils) that are available in Geographic Information System (GIS) format from USDA-Natural Resources Conservation Service. A second ARS database will include specialty crop physical growth requirements, and the production practices used for production that are estimated by a Bayesian method using USDA-National Agricultural Statistics Service Census of Agriculture data. Specialty crop growth requirements and production practice descriptions are available from state cooperative extension enterprise budgets and other sources. A third database developed through a cooperative effort between USDA-Economic Research Service and the Massachusetts Institute of Technology (MIT), Department of Urban Studies and Planning will include a national system of county-level consumption, production, and supply chain accounts. These accounts can be seasonalized from the same input data and modeling techniques used for the annual account development. A fourth database will include National Oceanographic and Atmospheric Administration climatic variables that are characterized for each county within the region. A fifth database will include transportation infrastructure (e.g., roads, railways, waterways) and price information already available in spatially referenced digital formats, as well as information maintained by USDA-Agricultural Marketing Service about terminal or wholesale markets, shipping points, and regional retail outlets. These five databases will then be linked as layers into a single GIS and analyzed to determine system production capacity, associated spatial and seasonal constraints, and future opportunities for producing specialty crops to satisfy current and future demand within the Eastern Seaboard Region. The MIT "M" language will be used to enhance interoperability across databases and formats, and combine, integrate, and analyze the GIS data.

Local-to-national policy-related constraints will be compiled and evaluated for their potential effects on expansion of local specialty crop production and marketing. Similar to a sensitivity analysis, this will include assessments of both existing and alternative policies pertinent to key topics such as land use, environmental protection, climate change, fuel use standards, food quality, and energy use. Projected consumption will be forecast based on predicted population growth and household cohort food expenditure profiles for each county. Current land availability, soil suitability, and environmental sustainability for crop production will be evaluated and compared with projected demand for those crops. Validated mechanistic biophysical models estimating crop growth and natural resources condition will be used to estimate location suitability for production and its environmental impacts. A Malmquist index approach will be used to estimate many-objective sustainability criteria across the region. Embodied energy pathways analysis will be used to compare the net energy requirements for local production systems throughout supply chains in the region, and compared to distant production systems. Existing models of income variability associated with weather events and market fluctuations will be used to assess potential production risks. Implications for food production, policy, and transportation infrastructure will be evaluated. Opportunities for increasing food security through improved transportation infrastructure, land use policies, and other options will be assessed.

**EXPECTED OUTCOMES:**

1. Growers and food distributors will be positioned to make informed decisions about the kinds and quantities of locally grown crops to produce and sell, and be able to choose the most advantageous market outlets having optimized transportation-incurred costs and possible favorable qualities preferred by their customers.

2. Policy makers will have science-based information for making risk-based decisions for developing and protecting the supply chain infrastructure in ways that ensure affordable, nutritious, and safe food supplies.

3. The sustainability of alternative food systems for all aspects of the supply chain from field to fork can be assessed and improved based on multiple productivity, profitability, and resource stewardship criteria.

4. Analytical tools and documented approaches will be developed for modeling and assessing food system security, not only in the Eastern Seaboard Region, but other U.S. and world regions.